

velocities: Duluth, NE. 34; Escanaba, N. 33; Milwaukee, NE. 34; Port Huron, N. 30; Sandusky, E. 36 and Oswego, NE. 28.

No. XII—appeared on the coast of Oregon on the afternoon of the 25th in rear of high area No. VII; 4:35 p. m., barometer at Roseburg 29.80 or 0.24 below normal and at 11 p. m. light rain had commenced falling. 26th, lowest pressure over Wash. Ty.; Olympia, 4:35 p. m., 29.67 or 0.34 below normal, after which centre passed northward, clearing weather by night at Roseburg, increasing rain at Portland and Olympia. 27th, southerly winds, with rain continued during the early morning at Portland and Olympia, but changed to northerly with temporary clearing weather as the following depression developed to the southward.

No. XIII—developed over northern California and southern Oregon on the 27th; cloudy, threatening and rainy weather from the coast to Utah; thunder-storm at Winnemucca, Nev. On this day a depression began to develop in the Missouri valley, which will be considered as area No. XIV, as the present area disappeared, probably to the northward, and high area No. X appeared on the coast of California.

No. XIV.—27th, falling pressure in the Missouri valley. 28th, central over southern Dakota; 11 p. m., lowest pressure, 29.56, or 0.38 below normal, at Bismarck; southeast to northeast winds and light rain from Wisconsin to Dakota; brisk to high southerly winds and high temperatures southward. 29th, central over Minnesota, with increasing rains and thunder-showers, with hail, at places southward to Missouri, and followed by colder northwest winds southward to Nebraska. 30th, it moved east northeastward over Canada; high temperatures prevailed throughout the Gulf and Atlantic States, and in Ontario, Can., several cases of sunstroke were reported. Cautionary Signals ordered for Lakes Superior and Michigan on the 28th, on Lakes Huron and Erie afternoon of the 29th, and Lake Ontario afternoon of the 30th were justified, except at Duluth, Buffalo, Rochester and Oswego. Maximum velocities, Marquette, SW. 36; Milwaukee, W. 40; Alpena, SW. 31; Port Huron, SW. 33; Sandusky, SW. 36; Cleveland, S. 36; Columbus, O., S. 36.

No. XV—developed during latter part of 29th and morning of the 30th over the high lands of north-western Texas. 30th, 4:35 p. m., (Washington time) brisk southerly winds over Texas increasing to high over Indian Territory, with a general temperature of from 90° to 100°; easterly winds and threatening weather in the Lower Missouri valley; northerly winds over western Nebraska and Kansas, increasing to NW. 44 miles at Dodge City, and of a temperature ranging from 60° to 72°. Snow fell on the mountains around Denver and Santa Fe, and by morning of the 31st the thermometer fell to 10° on summit of Pike's Peak. From 4 to 10 p. m. several tornadoes swept over portions of eastern Kansas, southeastern Nebraska and northern and western Missouri, brief notice of which will be found under the head of *Local Storms*. The general direction of these tornadoes appears to have been uniformly northeastward, corresponding with that of the centre of depression. Along the immediate northern margin of this track very heavy rain fell during the night of the 30th. 31st, centre of depression increased in area with rising pressure and decreasing energy, and by 4:35 p. m. formed an elongated trough extending from Arkansas and Missouri to southern Michigan, attended by cool and brisk northerly winds over the Upper Lakes, Northwest and Eastern slope and by southerly winds from the Ohio valley and Lower Lakes south and eastward. Throughout the day cloudy and rainy weather, with occasional heavy thunder-storms, prevailed from the Southwest to Tennessee, the Lake region and Iowa. Cautionary Signals ordered up in advance of preceding area were continued. Maximum velocities, Detroit, S. 36; Dodge City, NW. 56; Cautionary Signals ordered for Indianola and Galveston on the afternoon of the 29th were justified; Indianola, midnight of 31st, NE. 39.

## INTERNATIONAL METEOROLOGY.

The extra chart distributed with the present *Monthly Review*, is based on the daily charts published with the *Bulletin of International Simultaneous Observations for October, 1877*. It has been prepared in accordance with special instructions from the Chief Signal Officer, and shows the average pressure at sea level, the temperature and prevailing winds for October, 1877, at 7:35 a. m., Washington time as given by the simultaneous observations reported to this Office.

On chart No. IV are shown the probable tracks of storm-centres over the oceans, deduced from data received at this office up to June 2nd, and in the upper right-hand corner will be found an index to the same. In the upper left-hand corner is a small table giving the approximate wind direction and probable maximum velocities (in miles per hour and meters per second) attending the depressions on the dates named. The following is a brief notice of the same, and also of some storms over the Southern Hemisphere:

*North Atlantic Ocean.*—No. I is a continuation of area of low barometer No. IV of the *April Review*; it passed over Newfoundland during the latter part of the 4th; on the 5th, strong SW. gales (veering on the 6th to NW.) and very high seas were experienced about 46° N., 40° W.; 6th, SW. and NW. strong gales and high seas extended eastward to 30° W., and rapidly falling pressure was reported on the coast of Ireland; on the 7th, this depression probably joined area No. X of the *April Review*. No. II appeared on the 7th to the southeast of Newfoundland, and during the night developed into a very severe storm, with winds of hurricane force, about 45° N., 40° W. No. III is a continuation of low area No. VI of the *April Review*; it passed eastward north of Newfoundland on the 9th and 10th, and probably followed the

track shown on the chart; on the 12th, it was accompanied by heavy rains and south-east winds from 30° to 15° W., and followed by hard NW. gales about 30° W.; 13th to 17th, it moved from the Bay of Biscay to the Baltic. No. IV is a continuation of low area No. VII of the *April Review*. This track is very doubtful from the 12th to 16th, and the storm that was experienced in mid-ocean on the 17th may have been due to a new depression; 18th, very heavy NW. gales prevailed about 45° N., 40° W., which extended eastward on the 19th to 20° W., as the centre approached the Irish coast where it was preceded by severe SE. gales. No. V developed over the western Mediterranean on the 15th and 16th, in the south quadrant of area No. III, with the centre of which depression it apparently united on the 18th. No. VI is a continuation of low area No. X of the *April Review*; it passed eastward between the Bermudas and Nova Scotia on the 19th; 20th and 21st, it was accompanied by strong gales and heavy rain and squalls, and on the 22nd and 23rd passed over the British Isles. No. VII is a continuation of low area No. XIV noticed in the *April Review*; it apparently developed off the coast of Nova Scotia on the 23rd and moved very slowly eastward as a very severe storm, with hurricane winds and very high seas, on the 24th, 25th and 26th; 27th it rapidly decreased in energy and probably moved northward. *South Atlantic Ocean*.—On *February* 27th, a very severe storm was probably central about 50° S., 50° W., and moving southeastward; at Montevideo, the lowest pressure of the week occurred on the 24th, with rain and brisk to strong winds. *April* 8th, 27° S., 29° W., heavy squalls, thunder, lightning and heavy rain for 16 hours. *North Pacific Ocean*.—No. I is possibly a continuation of storm-centre No. II, chart IV, *March Review*; it was experienced on *February* 4th and 5th, 1879, as a SSE. to SW. gale in lat. 32° N., barometer 29.65. No. II, *February* 9th barometric depression (29.85.) with SSE. to NW. winds and rough sea. No. III, *February* 25th, depression (29.60.) with SE. to SW. winds, showers, and confused sea. No. IV, possibly a continuation of storm-centre No. I, chart IV, *April Review*; it was encountered from *March* 1st to 4th, as an extensive depression, from (barometer 29.58.) long, 176° W. to 168° E., about lat., 38° N., preceded by SE. strong winds and heavy rain and followed by northerly gales, hail, sleet and high seas; and on *March* 9th, a "very heavy gale from SSW., with high seas," was experienced in 37° N., 149° W. No. V probably shows somewhat correctly the track of a storm from *March* 15th to 22nd; it was accompanied from the 16th to 18th by NE'ly gales in the Straits of Formosa and on the 21st the barometer at Yokohama fell to 29.59. No. VI, *March* 29th and 30th, SW. gales at Yokohama, and S. to NW. gales in 40° N., 160° E., with heavy rains and rough seas, barometer 29.74. No. VII, *April* 1st, 43° 23' N., 175° 08' E., barometer 29.58, NE. strong gales, heavy rain and rough, cross, turbulent sea. No. VIII, *April* 4th, 45° N., 164° 35' W., barometer 29.87, SW. fresh gale, considerable rain, rough sea. No. IX, from *April* 7th to 13th an extensive area of low pressure existed on the coast of Alaska, the barometer at Sitka showing two minima on the 9th and 11th, (29.36 and 29.38 respectively,) with calms and light rains; on the 7th and 8th, westerly gales and hail squalls prevailed in about 42° N., 140° W. *South Pacific Ocean*.—*February* 8th, 1879, 50° 28' 104° 10' W., heavy WSW. gale, heavy seas. *March* 7th, 1879, 23° 17' S., 174° 22' W., commenced blowing very heavy from E. by N., barometer falling; wind veered to S.; 6 p. m. barometer 28.75, hurricane. *March* 16th, 1879, 36° S., 138° W., gale from SSE., last sails, &c. *Straits of Sunda*.—Heavy westerly gales and an easterly current of four miles per hour prevailed in these Straits from *December* 7th to 31st, 1878, detaining a fleet of about 40 vessels, some of them the finest ocean clippers, to the eastward of Sumatra. *Indian Ocean*.—*March* 20th, 1879, Bark "Sarah Hobart" anchored outside Mauritius; had to put to sea in consequence of the approach of a hurricane. She returned on the 29th with loss of mainmast, mizzen-topmast, pump, boats, etc. *Mauritius*.—*March* 19th, 1879, barometer began to fall; 4:33 p. m., wind SE. by E., 24 miles; 20th, 4:33 p. m., barometer, corrected and reduced, 29.443 inches, or 747.85 mmf., wind SE., 51.3 miles, overcast, squally, rain; 21st, 2:15 a. m., lowest barometer, corrected and reduced, 29.032, or 737.3; 5:30 to 6:30 a. m., greatest mean hourly velocity of wind during storm, 80.3 miles; 4:33 p. m., 29.623, or 752.40, NE. by N., 45.5 miles, wind and weather moderating.

*Unalaska Island, Alaska*.—Reports received from the Signal Corps Observer at Unalaska contain the following items:

MONTH.	Temperature.			Relative Humidity.	Rain-fall.	Days.			Wind—prevailing direction.
	Mean *	Max.	Min.			Rain or snow	Snow	Clear	
1878.									
November.....	33.5	48	21	80	3.78	19	16	1	SW. & calm.
December.....	35.1	45	19	85	10.02	24	16	2	SE.
1879.									
January.....	34.0	48	20	84	2.88	21	17	1	SW.
February.....	29.2	44	7	84	1.35	16	9	1	SE.

\*  $\frac{7+2+4+9+9}{5}$

with foam, rainfall, 2.31 inches; all snow on hills gone, and only heavy drifts remain, winter so far unusually mild; at this date last year 27 feet (?) of snow lay on a level. *January* 21st, 1879, SW. gale; 22nd, SW., very gusty gale; 27th, fearful gusty gale; 28th, SW. high gusty gale backing to SE. at 9 p. m.; 29th, SE. brisk to high until 3.40 p. m., then SW. hurricane, 8.30 to 11. p. m. terrific gusts rapidly succeeding each other, aneroid barometer at 4.20 p. m. 27.70, lowest reading ever recorded here; 30th, SW. terrific gale moderating. *February*, gusty gales on the 5th, 6th and 7th from SE.; and 19th, 20th and 22nd from N. NW. and W.

*Gales, &c.*—*November* 8th, SE. to SW. gusty gales, veering on the 9th to W. strong gale; 10th, SE. gusty gale. *December* 3rd, SE. strong gale; 13th, SE. strong gale; 21st, N. fearful gale, terrific gusts; 22nd, N. to NW. gale; 27th, SE. high gale; 28th, terrific gale increasing to storm; 29th, SW. gusty gale; 31st, SE. to E. hurricane in awful gusts, aneroid barometer read 27.84 at 4.20 p. m., having fallen 1.56 inch in nine hours, bay white

*York Factory, Hudson's Bay, British America.*—Observations taken at 7 a. m., 2 and 9 p. m., give the following means, &c.:

MONTH.	Barometer.			Thermometer.			Prevail- ing wind.	Total rain-fall.	No. of Days.			Mean rela- tive hu- midity.
	Mean.	Max.	Min.	Mean. *	Max.	Min.			Rain or snow.	Snow.	Aurora	
1878—June.....	29.64	30.21	29.40	64.9	100.0	26.0	E.	10.50	11	1	5	70.6
July.....	29.71	30.19	29.17	73.3	106.0	46.0	NE.	14.80	16	0	3	64.8
August.....	29.82	30.06	29.40	68.0	91.0	38.0	NE.	4.90	9	0	6	82.1
September.....	29.68	30.33	29.44	57.1	60.0	26.0	N.	13.63	19	8	7	95.2
October.....	29.86	30.30	29.18	21.6	39.0	— 2.0	N., NW	2.41	19	19	11	94.6
November.....	29.84	30.53	29.22	17.3	35.0	—15.9	S., NW	0.82	17	17	6	92.2
December.....	29.97	30.40	29.16	— 6.9	29.0	—28.0	NW.	0.43	20	20	3	82.1
1879—January.....	30.05	30.69	29.44	—23.6	0.0	—43.0	NW.	0.15	8	8	17	76.2
February.....	30.00	30.68	29.22	—28.9	— 1.6	—48.0	NW.	0.61	11	11	11	71.6

\*  $\frac{1}{4}$  (7+2+9+0.)

*June*, thunder-storms, 10th, 14th, 16th, 20th, 22nd, 27th; *Mirage*, 1st, 2nd, 7th, 9th, 11th, 15th, 16th, 21st, 22nd, 23rd, 28th, 30th. *July*, thunder-storms, 4th, 6th, 8th, 22nd, 25th, 30th, 31st; *Mirage*, 9th, 14th, 19th, 21st. *August*, mirage, 1st, 9th, 11th, 17th; thunder-storms, 6th, 13th, 14th, 22nd; meteors, 10th, 11th, 12th. *December*, solar halos on 10 days; lunar halos on 11 days. *January* 30th, ice on river 4 feet 3 in. *February* 28th, ice on river 5 feet 7 inches thick.

*Paramaribo, Dutch Guiana, S. A.*—Observations taken at 7 a. m., 2 and 9 p. m., local time, give the following means, &c.:

MONTH.	Barometer.			Thermometer.			Prevail- ing wind.	Total monthly rain-fall.	Days on which rain fell.	Mean rela- tive hu- midity.
	Mean.	Max.	Min.	Mean. *	Max.	Min.				
1878—July.....	29.99	30.04	29.89	80.6	88.0	75.0	E.	10.28	20	83
August.....	29.98	30.04	29.93	80.7	89.0	75.0	E.	8.14	21	82
September.....	29.96	30.01	29.87	83.5	91.0	75.0	E.	1.39	3	71
October.....	29.91	29.97	29.82	81.5	85.0	78.0	E.	6.12	8	78
November.....	29.91	29.97	29.83	82.7	92.0	74.0	E.	6.12	8	79
December.....	29.90	30.10	29.82	80.5	90.0	74.0	E.	10.77	20	84
1879—January.....	29.93	29.99	29.83	78.6	85.0	73.0	E., NE.	13.46	23	86
February.....	29.95	30.00	29.86	79.2	87.0	74.0	E., NE.	5.07	9	84

\*  $\frac{1}{4}$  (7+2+9+0.)

## TEMPERATURE OF THE AIR.

The isothermal lines on chart No. II show the general distribution of the temperature of the air for the month. By a reference to the table of average temperatures upon the same chart it will be seen that the temperature of the present month has been above the average of several years in all the districts except in Florida, Arizona, Nevada, Idaho, and the Pacific Coast States. The *minimum* temperatures of the month occurred over California on the 7th and 8th during passage of high area No. III; from the Western Plateau to the northwest from the 3rd to 7th during high area No. IV; thence to the Atlantic coast from the 1st to the 3rd during high area No. I. The *maximum* temperatures of the month occurred over California on the afternoon of the 31st; over Western Plateau on the 13th and 14th accompanying low area No. VI; Rocky Mountains on the 2nd and from the 21st to the 27th; Southwest, 19th to 21st accompanying low area No. IX; Gulf States, 17th to 28th; South Atlantic States, 25th to 31st and in the Lake region, Ohio valley, Middle States and New England from the 29th to the 31st.

*Minimum and Maximum Temperatures*, respectively, are for *Maine*—At Eastport, 36° and 63°; Orono, 28°, 88°. *New Hampshire*—Dunbarton, 39°, 90°; Summit of Mt. Washington, 13°, 62°. *Vermont*—Burlington, 34°, 89°; Woodstock, 26°, 91°. *Massachusetts*—Boston, 38°, 93°; Rowe, 30°, 82°. *Rhode Island*—Newport, 40°, 76°. *Connecticut*—Southington, 34°, 85°. *New York*—New York City, 40°, 86°; Schroon Lake, 26°, 94°; Albany, 36°, 89°; Buffalo, 33°, 84°. *New Jersey*—Princeton, 29°, 90°; Atco, 45°, 96°. *Pennsylvania*—Near Franklin, 26°, 88°; Pittsburgh, 35°, 93°; Philadelphia, 31°, 91°. *Delaware*—Dover, 48°, 88°. *Maryland*—Baltimore, 43°, 94°; Emmitsburg, 31°, 86°. *District of Columbia*—Washington, 36°, 94°. *Virginia*—Snowville, 27°, 86°; Norfolk, 48°, 96°. *West Virginia*—Helvetia, 28°, 88°. *North Carolina*—Murphy, 31°, 89°; Weldon, 51°, 95°; Kittyhawk, 45°, 91°. *South Carolina*—Aiken, 52°, 92°; Charleston, 55°, 88°. *Georgia*—Augusta, 48°, 91°; near Forsyth, 54°, 94°. *Florida*—Houston, 60°, 98°; Key West, 68°, 91°. *Alabama*—Green Spring, 46°, 90°; Montgomery, 50°, 96°. *Mississippi*—Near Brookhaven, 52°, 89°; Vicksburg, 55°, 94°. *Louisiana*—New Orleans, 58°, 86°; Shreveport, 61°, 92°. *Texas*—Pilot Point, 40°, 97°; Eagle Pass, 65°, 116°; Galveston, 64°, 89°. *Ohio*—Westerville, 29°, 91°; Ruggles, 40°, 95°. *Kentucky*—Louisville, 43°, 92°. *Tennessee*—Knoxville, 38°, 91°; Memphis, 50°, 96°. *Arkansas*—Mt. Ida, 44°, 88°. *Michigan*—Lansing, 25°, 91°; Ypsilanti, 25°, 90°; Alpena, 29°, 86°. *Indiana*—Spiceland, 32°, 89°. *Illinois*—Marengo, 36°, 92°; Anna, 46°, 95°. *Missouri*—Oregon, 38°, 93°; Kansas City, 40°, 93°; St. Louis, 45°, 91°. *Kansas*—Wellington, 38°, 97°; Lea enworth, 40°, 92°. *Wisconsin*—Neillsville, 26°, 86°; Embarras, 38°, 88°. *Iowa*—Logan, 26°, 88°; Fort Madison, 30°, 93°. *Nebraska*—Plattsmouth, 34°, 91°;